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Remediation Program Manager
HQ AFCEE/MMR
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SUBJECT: AFCEE 4P F41624-03-D-8595; Task Order 0251
MMR SPEIM/LTM/O&M Program
CDRL #A001E
Fuel Spill-28 2005 Summary Letter Report

Dear Mr. Davis:

This letter report includes a summary of the activities performed and the data collected for the Fuel Spill-28 (FS-28) System Performance and Ecological Impact Monitoring (SPEIM) program between 01 April 2004 and 31 December 2005. The prior SPEIM submittal for the FS-28 plume was the *Final Fuel Spill-28 2004 Annual System Performance and Ecological Impact Monitoring Report* dated December 2004 that included data collected through March 2004 (AFCEE 2004)[2].

The contaminant of concern (COC) for the FS-28 plume is ethylene dibromide (EDB). The FS-28 extraction, treatment, and discharge (ETD) system began operating on 14 October 1997, and was designed to extract 600 gallons per minute (gpm) from the aquifer using one extraction well. On 14 April 1999, the ETD system was expanded with the addition of the shallow wellpoint (SWP) extraction system. The FS-28 ETD system is currently designed to extract 750 gpm from the aquifer using one extraction well and 43 of 204 SWPs. The water is treated by a granular activated carbon system and discharged to the middle reach of the Coonamessett River via two vertical riser pipes (i.e., bubblers). The FS-28 plume and treatment system are presented in Figure 1.

The Air Force Center for Environmental Excellence (AFCEE) installed the FS-28 ETD system under a time critical and non-time critical action which became the selected alternative in the Final Record of Decision (AFCEE 2000)[3].

FS-28 SPEIM ACTIVITIES

The SPEIM program was developed to monitor plume changes and to ensure the effective operation of the AFCEE groundwater remediation systems at Massachusetts Military Reservation (MMR). These objectives are met through monitoring of selected media (i.e., groundwater, surface water) within and outside the plume boundaries, treatment plant monitoring, and groundwater flow and transport modeling. Activities completed for the FS-28 SPEIM program during this reporting period (01 April 2004 through 31 December 2005) include the following:

Standard SPEIM Sampling Activities:

- Annual (April 2004 and March 2005), semiannual (September 2004 and September 2005), and quarterly (June 2004) groundwater sampling
- Synoptic water level measurements (June, July, and October 2004)
- Annual surface water sampling (April 2004 and March 2005), quarterly surface water sampling (June, August, and September 2004 and June 2005) and monthly surface water sampling (April through October 2004 and March through November 2005)
- Seasonal (April 2005, July 2005, and October 2005) recreational beach area surface water sampling
- Monthly treatment plant sampling (April 2004 through December 2005)
- Recording of daily average treatment system flow rates (April 2004 through December 2005)
- Monthly sampling of the Coonamessett Public Water Supply Well (CWSW) and two sentry wells (April 2004 through July 2005)
- Quarterly sampling of the CWSW sentry wells (October 2005 and January 2006)

The groundwater and surface water locations sampled for the FS-28 SPEIM program between April 2004 and December 2005 are presented in Figure 2. Groundwater and surface water monitoring locations utilized for hydraulic monitoring between April 2004 and December 2005 are depicted in Figure 3. The well construction and surface water location information is included in Table 1. The current approved FS-28 SPEIM network, including analytical scope and methods, is presented in the *Comprehensive Long Term Monitoring Plan*, which is available on-line at www.mmr.org under Plans and Protocols.

Groundwater analytical results are presented in Table 2 and surface water analytical results are presented in Table 3; these summary tables include results for the COC and field parameters. A map showing the distribution of EDB in groundwater is included as Figure 4. Hydraulic monitoring results are included in Table 4. A comparison of all compounds detected in groundwater, surface water, and treatment plant samples to applicable standards is included in Attachment A.

Additional Sampling Activities:

- LaSalle Bog surface water (69SW4002) and irrigation well (69IG0012) sampling (July 2005)
- Augusta Bog irrigation pond (69SW4001) sampling (August 2005)
- Collect groundwater samples from 17 leading edge locations (August 2005)
- Collection of shallow groundwater samples beneath the western bog ditch of the East Thompson Bog at 16 locations (69DP2000 – 69DP2015) (August 2005)
- Collection of four surface water samples from the western bog ditch of the East Thompson Bog (69SW4003 – 69SW4006) (August 2005)
- Sample one residential well (September 2005)
- Leading edge synoptic water level survey (May and November 2005)

Drilling Activities:

- Installation of five direct push borings (69DP0105, 69DP0106, 69DP0107, 69DP0107A, and 69DP0108) to characterize the top of the northern lobe of the plume, between 69MW1303 and 69MW1283.
- Installation of two direct push borings (69DP0101 and 69DP0109) to characterize the plume between 69MW1317 and the SWPs.
- Installation of 26 direct push borings (69DP0102, 69DP0103, 69DP0104, 69DP0110 through 69DP0131, and 69DP1006) to characterize the uncaptured portion of the plume.
- Installation of one direct push boring (69DP1013) to obtain purge water quality information.
- Direct push drilling was used to install monitoring wells 69MW1306C and 69MW1317C and piezometers 69PZ0005A,B; 69PZ0006B; 69PZ0013A,B; 69PZ0017A,B; 69PZ0018A,B; 69PZ0019A,B; 69PZ0020A,B; 69PZ0021A,B; and 69PZ0022A,B.
- Sonic drilling was used to install piezometers 69PZ0004A,B and 69PZ0012A,B and monitoring well 69MW0012A.
- Sonic drilling was used to collect continuous soil samples at 69BH2000.

The drilling locations are depicted on Figure 5, and the vertical profile groundwater data and well construction diagrams for these locations are presented in Attachment B.

Presentations:

Presentations for the FS-28 plume are listed in Table 5.

Project Note Submittals:

The project notes submitted for the FS-28 plume under the SPEIM program are included in Attachment C.

Report Submittals:

- *Draft Fuel Spill-28 2004 System Performance and Ecological Impact Monitoring Report* (July 2004)
- *Final Fuel Spill-28 2004 System Performance and Ecological Impact Monitoring Report* (December 2004)
- Monthly data transmittals of the monitoring results for the Coonamessett Water Supply Well and sentry wells (April 2004 through August 2005)
- Quarterly data transmittal of the monitoring results for the Coonamessett Water Supply Well sentry wells (October 2005)

Optimizations:

Optimization activities are completed as part of the SPEIM program in order to improve the performance of the remedial systems and to improve the monitoring program. Recommendations for optimizing the FS-28 remedial system were presented in the *Optimization of the FS-28 Shallow Wellpoint System* Project Note which was submitted on 08 June 2005 and is included in Attachment C. The FS-28 SPEIM network was optimized through recommendations presented in the *Final Fuel Spill-28 2004 Annual System*

Performance and Ecological Monitoring Report (AFCEE 2004)[2] and in the *FS-28 SPEIM Monitoring–Optimization of the Shallow Wellpoint Monitoring* project note (included in Attachment C).

FS-28 REMEDIAL STATUS UPDATE

Analytical results from the influent and effluent sampling ports for the FS-28 treatment plant are presented in Table 6. Average weekly flow rates for the FS-28 extraction well and shallow wellpoints system are presented in Table 7. Treatment system operational downtimes or deviations (for events lasting two hours or longer) between April 2004 and December 2005 are summarized in Table 8. Mass removal calculations through December 2005 for the FS-28 treatment plant are presented in Table 9.

The most recent plume shell for the FS-28 plume included data collected through December 2003 (AFCEE 2004)[2]. Based on the most recent plume shell mass estimates (approximately 5.9 pounds [lbs]) and assuming that plume mass decreased only through treatment system removal (approximately 1.9 lbs); the mass remaining in the FS-28 plume at the end of December 2005 is estimated to be 4.0 lbs of EDB. The volume of EDB-contaminated groundwater in the FS-28 plume, based on the December 2003 plume shell, is estimated to be 1.68 billion gallons.

The FS-28 remedial system is currently operating according to the 2005 Scenario 01 pumping regime (AFCEE 2005)[1]. Using the most recent plume shell and assuming the system will operate continuously under 2005 Scenario 01 pumping conditions, groundwater transport modeling results indicate that EDB at concentrations above the Massachusetts Maximum Contaminant Level will still be present in the FS-28 plume through 2047 (AFCEE 2004)[2]. Through the SPEIM program, remedial system operation is continuously evaluated and optimized to reduce cleanup times, therefore this timeframe will most likely be decreased in future scenarios.

FS-28 SPEIM ACTIVITIES PLANNED FOR 2006

Activities currently planned for the FS-28 SPEIM program for 2006 include the following:

- Annual (March through April 2006) and semiannual (September 2006), and groundwater sampling
- Quarterly sampling of the CWSW sentry wells (January, April, July, and October 2006)
- Monthly (March/April through October 2006) surface water sampling
- Semiannual synoptic water level measurements (June and September 2006)
- Recreational beach sampling (April and July 2006)
- Residential well sampling (April and October 2006)
- Monthly treatment plant sampling (January through December 2006)
- Recording of daily average treatment system flow rates (January through December 2006)
- Continued investigation at the leading edge of the FS-28 plume
- FS-28 SPEIM data presentations for data collected between January and June 2006 and for data collected between July and December 2006

- Submittal of an FS-28 Leading Edge Technical Memorandum
- Submittal of an FS-28 Model Calibration Technical Memorandum
- Optimization of the monitoring network

If you have any questions or comments, please contact Marty Aker at (508)-968-4670, extension 4971.

Sincerely,

CH2M HILL

Marc W. Slechta, P.G., L.S.P.
Program Manager

Attachments:

Figure 1	FS-28 Groundwater Plume and Treatment System
Figure 2	FS-28 Chemical Monitoring Locations
Figure 3	FS-28 Hydraulic Monitoring Locations
Figure 4	FS-28 2005 Ethylene Dibromide Detections
Figure 5	FS-28 Drilling Locations
Table 1	FS-28 Well Construction and Surface Water Sampling Location Information
Table 2	Groundwater Monitoring Results
Table 3	Surface Water Monitoring Results
Table 4	Hydraulic Monitoring Results
Table 5	FS-28 Meeting Presentations
Table 6	FS-28 Treatment Plant Sampling Results
Table 7	FS-28 Treatment System Flow Rates
Table 8	Treatment System Downtime Summary
Table 9	FS-28 Treatment System Mass Removal Summary
Attachment A	Comparison of Detected Concentrations in FS-28 Groundwater and Surface Water to Applicable Groundwater and Surface Water Standards
Attachment B	FS-28 Vertical Profile Groundwater Data
Attachment C	FS-28 Project Notes

Enclosures: (1 unbound, 7 bound, 7 CDs)

c: Rose Forbes, AFCEE (I)
Marty Aker, AFCEE (I)
Melvin Alli, AFCEE/ISA/COR (I CD)
Teri DuPriest, AFCEE/ACOR (1 CD)
AFCEE/MSCD (1 CD)
HSW/PKVB (1 w/o attach.)
Paul Marchessault, EPA (1 bound, 1 CD)
Peter Golonka, GF (1 bound, 1 CD)
Leonard Pinaud, DEP (I bound, I CD)
James Quin, EEG (I)
David Carignan, LBH (1 CD)
Steve Hurley, MDFW (1 CD)
Jeff LaFleur, CCCGA (1 CD)
Brian Handy, Handy Cranberry Trust (1)
Virginia Valiela, Town of Falmouth (1 CD)
Mark Kasprzyk, Consv (I CD)
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[1] AFCEE (U.S. Air Force Center for Environmental Excellence). 2005 (June). *Optimization of the FS-28 Shallow Wellpoint* System Project Note. 324146-SPEIM-FS28-PRJNOT-002. Prepared by CH2M HILL for AFCEE/MMR, Installation Restoration Program, Otis Air National Guard Base, MA.

[2] AFCEE (U.S. Air Force Center for Environmental Excellence). 2004 (December). *Final Fuel Spill-28 2004 System Performance and Ecological Impact Monitoring Report.* 187615-SPEIM-FS-28-ANRPT-002. Prepared by CH2M HILL for AFCEE/MMR, Installation Restoration Program, Otis Air National Guard Base, MA.

[3] AFCEE (U.S. Air Force Center for Environmental Excellence. 2000 (October). *Final Record of Decision for the Fuel Spill-28 and Fuel Spill-29 Plumes*. AFC-J23-35Q86101-M26-0009. Prepared by Jacobs Engineering Group Inc. for AFCEE/MMR, Installation Restoration Program, Otis Air National Guard Base, MA.